

PATENT COOPERATION TREATY

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

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25-07-04 (9um)

03 MEI 2004

BEANTWOORD

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

28.04.2004

Applicant's or agent's file reference

P56921PC00

IMPORTANT NOTIFICATION

International application No.

PCT/NL 03/00046

International filing date (day/month/year)

22.01.2003

Priority date (day/month/year)

25.01.2002

Applicant

TECHNISCHE UNIVERSITEIT DELFT et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)



Applicant's or agent's file reference P56921PC00	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/NL 03/00046	International filing date (day/month/year) 22.01.2003	Priority date (day/month/year) 25.01.2002
International Patent Classification (IPC) or both national classification and IPC B01D3/00		
Applicant TECHNISCHE UNIVERSITEIT DELFT et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 1 sheets.

- This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 11.08.2003	Date of completion of this report 28.04.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Degen, M Telephone No. +49 89 2399-8612 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/NL 03/00046**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-11 as originally filed

Claims, Numbers

2-4, 7-19 as originally filed

1, 5, 6 received on 07.01.2004 with letter of 07.01.2004

Drawings, Sheets

1/10-10/10 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/NL 03/00046**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-19
	No: Claims	
Inventive step (IS)	Yes: Claims	1-19
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-19
	No: Claims	



2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL03/00046

1. Reference is made to the following documents:

D1: US-A-4 025 398 (G.G.HASELDEN) 24 May 1977 (1977-05-24)

D2: US-A-4 234 391 (J.D.SEADER) 18 November 1980 (1980-11-18) cited in the application

D3: US-A-4 681 661 (R.GOVIND) 21 July 1987 (1987-07-21) cited in the application

2. None of the documents cited in the search report anticipate a heat integrated distillation column as indicated in **claim 1**, where the heat exchanging means consists of an open fluid connection between two volumes within the same column shell.

2.1 In **D1**, for example, even if the heating fluid comes out of a tray (first volume), the heat is transferred to a second volume which is external to the column. Thus, even if the principle of using one fluid to indirectly heat up (or cool down) one other fluid is given, the two volumes of **D1** are separate (not in contact through a partition) but within two separate columns.

2.2 In **D2** a partitioned column is represented. Heat is exchanged using the partitioning wall and a heat-pipe extending through the partitioning wall to the first volume at one end and to the second volume at the other end. Thus the difference is that no fluid from a first volume is allowed to exchange heat within the second volume in an open fluid connection.

2.3 In **D3**, the heat transfer only occurs through the shell of one inner column which is concentric with the outer annular column.

2.4 Novel is therefore the process of distilling air using the above column (**claim 18**) as well as the use of the above column for distillation (**claim 19**) (article 33(2) PCT).

3. Even if all the above documents solve the problem of energy saving within a distillation column none of them fairly suggests the use of a heat exchanging means in open fluid connection between two volumes of the column and located within the same column. Besides a more compact design, this technical feature allows better and rapid heat-transfer between the volumes. Thus the requirements of article 33(3) are fulfilled.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL03/00046

- 4 Dependent **claims 2-17** concern particular embodiments of the subject-matter of above independent **claim 1** and therefore, they fulfil the requirements of Articles 33(2) - (3) PCT as well.
5. The industrial applicability is evident (article 33(4) PCT).

Claims

1. Heat integrated distillation column comprising a cylindrical outer shell having an upper and a lower end and at least one first inner
5 volume and at least one second inner volume in the shell, and being in heat exchanging contact with each other through a wall separating the volumes, the improvement comprising providing means having heat exchanging capacity extending through the said wall from said at least one first volume into said at least one second volume, whereby the inside
10 of the said heat exchanging means is in open fluid connection with the said first volume.

2. Column according to claim 1, wherein the said column is provided with an inner tube which is concentric with the outer shell, thereby
15 defining a volume inside the inner tube and an annular volume between inner tube and outer shell.

3. Column according to claim 1, wherein the said first and said second volume have been created by a separating wall extending along the inside of the outer shell, and connected at both ends to the outer wall.

4. Column according to claims 1-3, wherein said first volume is constructed to act as stripping section and said second volume as
20 enriching section.

5. Column according to claims 1-4, wherein the heat exchange means are present in the volume that has been designed as the volume
25 with the highest temperature and is in open connection with the volume designed to have the lowest temperature.

6. Column according to claims 1-4, wherein the heat exchange means are present in the volume that has been designed as the volume with the lowest temperature and is in open connection with the volume
30 designed to have the highest temperature.